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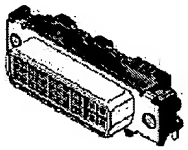
Video interconnect technology: VGA, DVI and the future

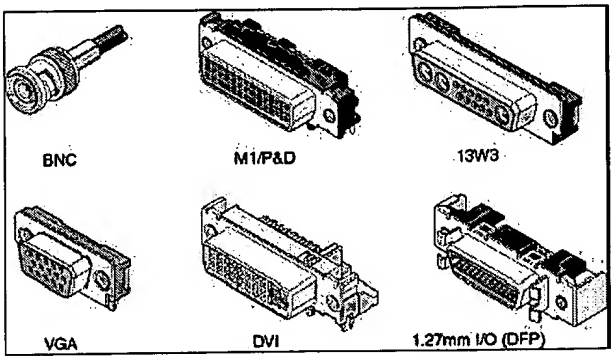


by Gary Manchester, group product manager, Molex Inc., Lisle IL.

Interconnects represent an unglamorous but critical link that has been unchanging in the display industry for the last 10 years. In the early 80s the analog VGA interface was adopted quickly as the de facto standard and marked the move from the digital EGA to a more colorful world. VGA brought us the color monitors that now occupy more than 90% of our desktops.

During the latter half of the 80s, IBM and other system manufacturers saw performance limitations of the VGA, and a host of interface standards resulted. The industry developed basically seven primary interfaces. The computer and graphics industry standardized on VGA; virtually every system shipping through the 90s came with it. Towards the end of the decade, performance issues with the analog interface, combined with growing demand for a digital interface for flat panels, drove change.

Through the 90s system manufacturers developed several interfaces, looking for better performance for the then high end displays. The BNC and 13W3 interface both use 75-ohm coax for the critical red, blue and green signals. IBM, Sun and others adopted the 13W3 on their high-end analog displays. Monitor manufacturers adopted 3-5 BNC as the monitor interface. The major drawbacks were size, cost and the lack of standardization of the control line interfaces between manufacturers.



System manufacturers have developed a number of interfaces providing better performance for high end displays.

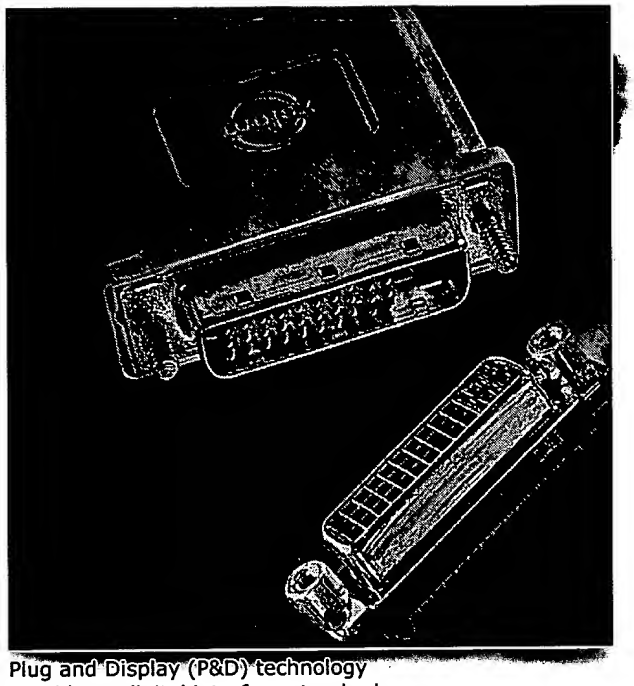
In the latter half of the 90s VESA released the Plug and Display (P&D - formally known as the EVC) standard, which initially offered an analog interface with the performance needed for new high-end analog displays. Eventually it offered a digital interface standard based on transition minimized digital signaling (TMDS). The interface also supported other multimedia interfaces such as 1394 and USB, key benefits to designers and end users.

However, eventually these became weaknesses, because signals could not be routed easily to the connector in today's PC platform. IBM and HP use the P&D interface, but it is limited to high end or special applications.

Recognizing the need for a digital interface and not considering the options that P&D offered, Compaq brought the DFP standard to the industry. This was based on another 1.27mm leaf-style I/O connector interface. DFP also used TMDS as its transmission interface, making it somewhat compatible with P&D. It came and left quickly, as the interface had limited bandwidth and no analog support. If you wanted to support both a digital and analog interface, two connectors were needed, not acceptable in notebook applications.

In 1999, the Digital Display Work Group (DDWG) released the Digital Visual Interface (DVI) standard. Its basis was the P&D interface, but without any of the multimedia functions. Like P&D, DVI supports a high performance analog, but instead of one channel of TMDS, it provides a dual channel digital interface option. The second channel has the capability of digital video bandwidth up to 9.9Gbps, enough for future display products. Since its release in April 2000, DVI has become widely accepted as the interface choice for the computer industry's digital video output.

Initial applications used the DVI-D or digital-only option in the standard. The current trend is to offer DVI with the analog and digital options on the host side interface. This provides a transition path from VGA's analog interface. It allows a higher performance analog interface for displays choosing to stay analog while offering customers the option for new digital displays.



Plug and Display (P&D) technology provides a digital interface standard based on transition minimized digital signaling (TMDS).

IBM and others are now beginning to offer the DVI analog interface on high-end CRT products and use the DVI-I, the DVI standards option for both analog and digital interface support. This allows customers to link to new digital flat panel products. Computer and graphic subsystems are starting to offer the higher performance analog interface in DVI and providing adapters for backward compatibility to VGA systems.

Like P&D, the DVI standard does define and standardize the physical connector interface and electrical performance. It also defines the cable link specification and provides test standards to evaluate connector and cable assemblies. This is a first in the industry and a first leap to compliance testing that could greatly improve DVI product compatibility across the more than 100 companies worldwide that make them.

Today DVI offers a secured link with High Definition Content Protection (HDCP) and is in discussion on ways to pass digital audio over the same connector interface. Proposals for the audio support use the data transfer structures on the existing digital lines and the connector will not change. Increasing the speed of a TMDS link is being considered.

From the connector and cable link standpoint, work is underway so that the link can support at least 2.5Gbps over standard cable lengths of 2m to 10m. It is up to system, silicon and display companies to decide if they want to take the link speed to these levels.

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